

## Amendments to the Claims

5 This listing of the Claims will replace all prior versions and listings of the claims in this patent application.

## Listing of the Claims

Claims 1-91 (canceled)

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92. (currently amended) A ~~chip package bonding structure on a chip comprising a pad exposed by an opening in a passivation layer,~~ comprising:

a substrate comprising a solder mask layer and a first pad exposed by a first opening in said solder mask layer;

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a silicon chip over said substrate, wherein said silicon chip comprises a second pad having a top surface with a first region, a second region and a third region between said first and second regions, and a passivation layer on said first and second regions, wherein an opening in said passivation layer is over said third region and exposes said third region;

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a ~~metal~~ copper pillar between said second region and said first pad, wherein said second pad is connected to said first pad through said copper pillar; ~~over all region of said pad exposed by said opening in said passivation layer;~~ and

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a metal layer between said copper pillar and said third region, wherein said metal layer is on said second region, under said passivation layer and under said first and third regions; and

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a tin-containing cap between said copper pillar and said first pad, ~~over said metal pillar,~~ wherein said tin-containing cap comprises silver, and wherein said tin-containing cap has a first thickness ~~greatest transverse dimension~~ less than a second thickness ~~transverse dimension~~ that of said ~~copper metal~~ pillar.

Claims 93-96 (canceled)

97. (currently amended) The chip package bonding structure of claim 92, wherein said copper metal pillar is cap comprises an electroplated metal.

Claim 98 (canceled)

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99. (currently amended) The chip package bonding structure of claim 92, wherein said tin-containing cap further comprises copper, bismuth.

Claim 100 (canceled)

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101. (currently amended) The chip package bonding structure of claim 92 further comprising a conductive layer between said copper metal pillar and said tin-containing cap, wherein said second thickness is metal pillar having a height greater than a third thickness that of said conductive layer.

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Claims 102 and 103 (canceled)

104. (currently amended) The chip package bonding structure of claim 92, wherein said tin-containing cap has a melting point less lower than that of said copper metal pillar.

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Claim 105 (canceled)

106. (currently amended) The chip package bonding structure of claim 92, 105, wherein said metal layer comprises titanium.

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107. (currently amended) The chip package bonding structure of claim 92, 105, wherein said metal layer comprises a titanium-tungsten alloy, tungsten.

108. (currently amended) The chip package bonding structure of claim 92, 105, wherein said metal layer comprises chromium.

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109. (currently amended) The chip package bonding structure of claim 92, 105, wherein said metal layer comprises copper.

Claims 110-117 (canceled)

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118. (currently amended) The chip package bonding structure of claim 92, wherein said tin-containing cap is directly on said copper metal pillar.

Claim 119 (canceled)

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120. (currently amended) A bonding structure on a chip comprising a pad having a top surface with a first region, a second region and a third region between said first and second regions, and a passivation layer on said first and second regions, wherein an opening in said passivation layer is over said third region and exposes said third  
15 region, exposed by an opening in a passivation layer, comprising:

a metal layer on said third region, over said passivation layer and over said first and second regions;

a copper pillar on said metal layer, over said passivation and over said first and second regions; over said pad; and

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a tin-containing cap over said copper pillar, wherein said tin-containing cap comprises silver, and wherein said tin-containing cap has a first thickness greatest-  
transverse dimension less than that a second thickness of said copper pillar.

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121. (currently amended) The bonding structure of claim 120, wherein said tin-containing cap is directly on said copper pillar.

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122. (currently amended) The bonding structure of claim 120, 121 wherein said tin-containing cap has a greatest transverse dimension less than that of said copper pillar, further comprising a metal layer between said copper pillar and said pad, said  
copper pillar having a thickness greater than that of said metal layer.

123. (currently amended) The bonding structure of claim 120, 122, wherein said metal layer comprises titanium.

124. (currently amended) The bonding structure of claim 120, wherein said  
5 tin-containing cap further comprises copper. ~~lead~~.

125. (currently amended) The bonding structure of claim 120, 122, wherein said metal layer comprises chromium.

10 126. (currently amended) The bonding structure of claim 120 further comprising a conductive layer between said copper pillar and said tin-containing cap, wherein said second thickness is copper pillar having a height greater than that a third thickness of said conductive layer.

15 127. (currently amended) The bonding structure of claim 120, 126, wherein said metal layer comprises a titanium-tungsten alloy. ~~conductive layer covers part of a top surface of said copper pillar~~.

20 128. (currently amended) The bonding structure of claim 120, 126, wherein said metal layer comprises copper. ~~conductive layer covers all of a top surface of said copper pillar~~.

129. (currently amended) The bonding structure of claim 120, wherein said tin-containing cap has a melting point less ~~lower~~ than that of said copper ~~metal~~ pillar.

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Claims 130-150 (canceled)

151. (currently amended) A bonding structure on a chip comprising a pad having a top surface with a first region, a second region and a third region between said first and  
30 second regions, and a passivation layer on said first and second regions, wherein an opening in said passivation layer is over said third region and exposes said third region, ~~exposed by an opening in a passivation layer~~, comprising:

a metal layer on said third region, over said passivation layer and over said first and third regions;

a ~~copper metal~~ pillar on said metal layer, over said passivation and over said first and second regions; ~~over said pad, wherein said metal pillar comprises a~~

5 ~~tin-silver-copper alloy; and~~

a tin-containing cap over said ~~copper metal~~ pillar, wherein said tin-containing cap has a first thickness less than a second thickness of said copper pillar, and wherein said tin-containing cap has a greatest transverse dimension less than that of said copper pillar.

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152. (currently amended) The bonding structure of claim 151, wherein said tin-containing cap is directly on said ~~copper metal~~ pillar.

Claim 153 (canceled)

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154. (currently amended) The bonding structure of claim 151, ~~153~~, wherein said metal layer comprises titanium.

155. (currently amended) The bonding structure of claim 151, wherein said tin-containing cap ~~further~~ comprises silver, ~~lead~~.

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156. (currently amended) The bonding structure of claim 151, ~~153~~, wherein said metal layer comprises chromium.

157. (currently amended) The bonding structure of claim 151, ~~153~~, wherein said metal layer comprises copper.

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158. (currently amended) The bonding structure of claim 151, wherein said tin-containing cap ~~further~~ comprises silver and copper, ~~bismuth~~.

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159. (currently amended) The bonding structure of claim 151 further comprising a conductive layer between said ~~copper metal~~ pillar and said tin-containing cap, wherein

said second thickness is metal pillar having a height greater than that a third thickness  
of said conductive layer.

160. (currently amended) The bonding structure of claim 151, 159, wherein said metal  
5 layer comprises a titanium-tungsten alloy. conductive layer covers part of a top-  
surface of said metal pillar.

161. (currently amended) The bonding structure of claim 151, 159, wherein said metal  
layer comprises copper. conductive layer covers all of a top surface of said metal-  
10 pillar.

162. (currently amended) The bonding structure of claim 151, wherein said  
tin-containing cap has a melting point less lower than that of said copper metal pillar.

15 163. (previously presented) The bonding structure of claim 120, wherein said copper  
pillar is electroplated.

164. (currently amended) The bonding structure of claim 151, wherein said copper  
metal pillar is electroplated. comprises an electroplated metal.  
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